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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/779,437	02/09/2001	Alfred A. Barney	01997-286001	6675

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BOSTON, MA 02110

EXAMINER

JAGAN, MIRELLYS

ART UNIT	PAPER NUMBER
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2859

DATE MAILED: 03/03/2003

11

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/779,437

Applicant(s)

BARNEY ET AL.

Examiner

Mirellys Jagan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-50 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-50 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claims 1-14 and 48-50 are objected to because of the following informalities:

It is not clear in claims 1 and 48 what element's temperature is being determined, i.e., is it the temperature of the sensor or the temperature of the surface of the substrate? Claims 2-14, 49, and 50 are objected to for being dependent on an objected base claim. Appropriate correction is required.

2. Claim 49 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or rewrite the claim in independent form. Claim 49 claims a limitation already present in claim 1.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-31 and 48-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication 2002/0006153 to Ranson et al [hereinafter Ranson] in view

of U.S. Patent 6,322,901 to Bawendi et al [hereinafter Bawendi] and U.S. Patent 5,986,272 to Britton, Jr. et al [hereinafter Britton].

Ranson discloses a method of sensing temperature utilizing:

- a. a temperature sensor including a thermographic phosphor as a luminescent element,
- b. a light source for illuminating the sensor, and
- c. a detector that detects the light intensity emitted from the sensor,

wherein the method of sensing temperature has the following steps:

- a. providing the temperature sensor including the luminescent element on a surface of a substrate, the temperature sensor being a luminescent coating,
- b. irradiating a portion of the temperature sensor with an excitation wavelength of light from the light source,
- c. detecting the emission of light intensity from the sensor, and
- d. determining the temperature from the emission of light from the sensor (page 1, paragraph 9).

Ranson does not disclose the luminescent element being a semiconductor nanocrystal in a binder.

Bawendi discloses a fluorescent phosphor as a luminescent element comprising a semiconductor nanocrystal in a binder, which is luminescent when irradiated with an excitation wavelength of light. The luminescent element of Bawendi is a fluorescent phosphor since it is fluorescent upon excitation by a wavelength of light. The semiconductor nanocrystal includes a semiconductor, such as CdS, CdSe, or CdTe surrounded by an overcoat of a second

semiconductor material. A coat of an organic or inorganic overlayer surrounds the nanocrystal, the overlayer having a polymerizable moiety that has an affinity for the nanocrystal surface and a chosen binder such as an inorganic or organic polymer. The overlayer is used to convey solubility in order to disperse the coated nanocrystal into the chosen binder. The semiconductor nanocrystal is a member of a monodisperse core population that emits light in a spectral range of no greater than 75nm at FWHM, exhibits less than a 15% rms deviation in diameter with a particle size in the range of about 15-125 Å, and photoluminesces with a quantum efficiency of at least 10% (column 2, line 47-column 3, line 9, and column 10, line 64-column 11, line 3).

Britton teaches that it is known that fluorescent phosphors are thermographic phosphors (column 1, lines 39-45).

Referring to claims 1 and 48, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method disclosed by Ranson by replacing the luminescent element with the luminescent element disclosed by Bawendi, since Britton teaches that fluorescent phosphors are thermographic phosphors, and these elements are therefore alternate types of thermographic phosphors that can be used to determine temperature.

Referring to claims 15 and 24, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the temperature sensor disclosed by Ranson by replacing the luminescent element with the luminescent element disclosed by Bawendi, since Britton teaches that fluorescent phosphors are thermographic phosphors, and these elements are therefore alternate types of thermographic phosphors that can be used to determine temperature.

Referring to claims 6, 7, and 20, the use of the particular type of polymerizable moiety claimed by applicant, i.e., a hydrolyzable moiety or a metal alkoxide, absent ant criticality, is

considered to be nothing more than a choice of engineering skill, choice, or design, because the use of the particular moiety claimed by applicant considered to be the use of numerous and known alternate types of polymerizable moieties that a person having ordinary skill in the art at the time the invention was made would have been able to provide using routine experimentation in order to make the nanocrystal compatible with a chosen binder as already suggested by Ranson, Bawendi, and Britton.

5. Claims 32, 33, and 37-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,075,493 to Wickersheim in view of Bawendi, Britton, and U.S. Patent 5,233,020 to Hase et al [hereinafter Hase].

Wickersheim discloses that it is known in the art that thermographic phosphors are employed as a luminescent element in paint to create a temperature-sensing paint that is deposited on a surface to form a temperature-sensing coating (column 1, lines 53-62).

Wickersheim does not disclose the thermographic phosphor being a semiconductor nanocrystal in a binder, or the paint having a solvent as an ingredient.

Bawendi discloses a luminescent element comprising a semiconductor nanocrystal in a binder, which is luminescent when irradiated with an excitation wavelength of light. The luminescent element of Bawendi is a fluorescent phosphor since it is fluorescent upon excitation by a wavelength of light. The semiconductor nanocrystal includes a semiconductor, such as CdS, CdSe, or CdTe (which will inherently emit light independent of oxygen pressure) surrounded by an overcoat of a second semiconductor material. The nanocrystal is made by contacting a Cd donor with an S, Se, or Te donor to form a mixture and heating the mixture to form the

nanocrystal. A coat of an organic or inorganic overlayer surrounds the nanocrystal, the overlayer having a polymerizable moiety that has an affinity for the nanocrystal surface and a chosen binder such as an inorganic or organic polymer. The overlayer is used to convey solubility in order to disperse the coated nanocrystal into the chosen binder. The semiconductor nanocrystal is a member of a monodisperse core population that emits light in a spectral range of no greater than 75nm at FWHM, exhibits less than a 15% rms deviation in diameter with a particle size in the range of about 15-125 Å, and photoluminesces with a quantum efficiency of at least 10%.

Britton teaches that it is known that fluorescent phosphors are thermographic phosphors.

Hase discloses that it known that paints are formed of a binder and a volatile solvent.

Referring to claim 32, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the paint disclosed by Wickersheim by replacing the luminescent element with the luminescent element disclosed by Bawendi, since Britton teaches that fluorescent phosphors are thermographic phosphors, and these elements are therefore alternate types of thermographic phosphors that can be used in the paint to determine temperature.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the paint disclosed by Wickersheim by adding a solvent to the paint ingredients, as disclosed by Hase, since it is known that a solvent is commonly used with a binder as an ingredient in paint.

Referring to claim 39, the use of the particular type of volatile solvent claimed by applicant, i.e., an alcohol, absent ant criticality, is considered to be nothing more than a choice of engineering skill, choice, or design, because the use of the particular solvent claimed by

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applicant considered to be the use of numerous and known alternate types of volatile solvents that a person having ordinary skill in the art at the time the invention was made would have been able to provide using routine experimentation in order to provide a solvent that readily evaporates as already suggested by Wickersheim, Bawendi, Britton, and Hase.

Referring to claims 43-47, in manufacturing the paint disclosed by Wickersheim, Bawendi, Britton, and Hase, the method steps of claims 43-47 will inherently be followed.

6. Claims 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wickersheim, Bawendi, Britton, and Hase, as applied to claims 32, 33, and 37-47 above, and further in view of the prior art disclosed by applicant [hereinafter Prior Art].

Wickersheim, Bawendi, Britton, and Hase disclose a paint having all of the limitations of claims 34-36, as stated above in paragraph 5, except for the paint further comprising a pressure-sensitive composition that emits a light that is dependent on the oxygen pressure upon irradiation by an excitation wavelength of light, wherein the pressure-sensitive composition includes a platinum porphyrin.

The Prior Art discloses that temperature-sensing compositions can be used in combination with pressure-sensitive compositions including a platinum porphyrin that emits a light that is dependent on the oxygen pressure. The Prior Art discloses that it is beneficial to use the two compositions in order to provide a convenient and inexpensive way to determine the pressure or temperature of a surface (page 1 of the specification).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the paint disclosed by Wickersheim, Bawendi, Britton, and Hase

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by adding a composition having a luminescent element that is sensitive to pressure, as disclosed by the Prior Art, in order to provide a convenient and inexpensive way to determine the pressure or temperature of a surface.

Response to Arguments

7. Applicant's arguments with respect to claims 1-50 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents disclose utilizing phosphors as temperature sensors:

U.S. Patent 4,652,143 to Wickersheim et al

U.S. Patent 6,123,455 to Beshears et al

The following patent discloses nanocrystals in a thermoluminescent detector:

U.S. Patent 5,606,163 to Huston et al

The following patents and publication disclose utilizing a temperature-sensitive paint or layer:

Japanese Patent 2001004460 to Tsujishita et al

German Patent 3803336 to Kakoschke

Allison et al, "Development of Temperature-Sensitive Paints for High Temperature Aeropropulsion Applications", 37th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 8-11 July 2001.

The following patent and publications disclose a pressure-sensitive paint:

U.S. Patent 5,965,642 to Gouterman et al

Allison et al, "Sub-Microsecond Decay Time Phosphors For Pressure Sensitive Paint Applications", Oak Ridge National Laboratory, May 2001.

Allison et al, "A Survey of Thermally Sensitive Phosphors for Pressure Sensitive Paint Applications", Oak Ridge National Laboratory, May 2000.

The following patents disclose common paint ingredients:

U.S. Patent 4,427,835 to Bush et al

U.S. Patent 6,525,111 to Spencer et al

U.S. Patent 4,417,008 to Salensky et al

U.S. Patent 4,105,808 to McKenzie

U.S. Patent 6,287,377 to Binns et al

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mirellys Jagan whose telephone number is 703-305-0930. The examiner can normally be reached on Mon-Thu 8:00 - 4:00.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on 703-308-3875. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7725 for regular communications and 703-308-7725 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

mj
February 26, 2003



Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800